C.18C

IMPERIAL MYCOLOGICAL INSTITUTE
23 JULY 1934

University of Cambridge School of Agriculture Memoirs

Memoir No. 6

A brief summary of the papers published by the Staffs of the School of Agriculture and its Associated Research Institutes during the period May 1st, 1933—April 30th, 1934.

1934

ONE SHILLING NET

(*Postage—Two pence*)

Issued July, 1934

Correspondence relating to the Memoir and also Exchange Publications should be addressed to:

THE LIBRARIAN,
SCHOOL OF AGRICULTURE,
UNIVERSITY OF CAMBRIDGE,
CAMBRIDGE,
ENGLAND

University of Cambridge
School of Agriculture Memoirs

Memoir No. 6

A brief summary of the papers published by the Staffs of the School of Agriculture and its Associated Research Institutes during the period May 1st, 1933—April 30th, 1934.

Digitized by the Internet Archive
in 2025

https://archive.org/details/memoir-cambridge-agricultural-biology_1934_6

FOREWORD

This Memoir, which is published under the general editorship of the Librarian of the School, represents an attempt to present as succinctly as possible the contributions made by members of the Staffs of the School of Agriculture and its Associated Institutes to the development and progress of Agricultural Science, and to indicate to research workers interested the Journals in which the full papers are presented. Each summary is compiled by the author of the paper and is presented, so far as the subject matter will allow, in a non-technical form in order to be of value to the general body of farmers interested in the more recent developments of agricultural scientific research in general and of the activities of this Department in particular.

Requests for further information or criticism arising out of the summaries should be referred to the individual author concerned, criticisms and suggestions for the improvement of the Memoir itself should be addressed to the Librarian of the School.

E. T. H.

CONTENTS.

	PAGE
STAFF	7
INTRODUCTION	11
SUMMARIES	13
Agriculture	13
Agricultural Chemistry	13
Agricultural Economics	14
Agricultural Zoology (including Entomology)	17
Animal Breeding and Genetics	18
Animal Nutrition	20
Animal Physiology	24
Animal Production	27
Estate Management	28
Horticultural Chemistry	29
Physical Chemistry	29
Plant Breeding and Genetics	31
Plant Pathology	32
Plant Physiology	34
Soils and Manures	35
Statistics	36
Miscellaneous	37
Publications	38
Publications missing from Library Collections, etc.	41
Author Index	44
Subject Index	45

Members of Staffs, summaries of whose papers are included in these Memoirs.

TEACHING STAFF.

DEPARTMENT OF AGRICULTURE

DRAPER'S PROFESSOR OF AGRICULTURE

F. L. Engledow, M.A. (*Joh*)

EMERITUS PROFESSOR OF AGRICULTURAL BOTANY

Sir R. H. Biffen, M.A., F.R.S. (*Cath.*)

READERS

F. H. A. Marshall, C.B.E., Sc.D., F.R.S. (*Christ's*), Agricultural Physiology
J. Wishart, M.A., D.Sc.(*Lond.*), (*Clare*), Statistics

UNIVERSITY LECTURERS

E. H. B. Boulton, M.A. (*Cath.*), Forestry
N. Dean, M.A., F.S.I., L.R.I.B.A., M.R.San.I. (*Trin. H.*), Estate Management
F. H. Garner, M.A. (*Cla.*), Animal Husbandry
J. Line, M.A. (*Emm.*), Botany
W. S. Mansfield, M.A. (*Emm.*), Agriculture. Director of the University Farm
H. H. Nicholson, M.A. (*Selw.*), Soil Science
H. G. Sanders, Ph.D. (*Joh.*), Crop Husbandry
J. A. Venn, Litt.D. (*Queens'*), Gilbey Lecturer in the History and Economics of Agriculture
A. E. Watkins, M.A. (*Joh.*), Cytology
H. E. Woodman, M.A., Ph.D. (*Göttingen*), D.Sc. (*Leeds*), (*Down.*), Agricultural Chemistry
A. S. Watt, Ph.D (*Down.*), Gurney Lecturer in Forestry

OTHER LECTURERS

H. R. Barnell, (*Down.*), Plant Physiology
G. D. H. Bell, Ph.D. (*Selw.*), Univ. Demonstrator in Agricultural Biology
S. Dickinson, M.Sc. (*Wales*), Ph.D. (*Minn.*), Mycology
Col. W. A. Wood, C.B.E., M.A., M.R.C.V.S. (*Cai.*), Veterinary Science

SECRETARY

R. Ede, M.A., (*Queens'*)

LIBRARIAN

E. T. Halnan, M.A., (*Trin.*)

STAFF OF UNIVERSITY FARM

W. S. MANSFIELD, M.A. (*Emm.*), Director

ADVISORY STAFF FOR THE EASTERN COUNTIES

F. R. PETHERBRIDGE, M.A. (*Sid. Suss.*), Biologist
F. HANLEY, M.A. (*Cla.*), Chemist
W. A. R. DILLON WESTON, Ph.D. (*Cath.*), Mycologist
C. D. OXLEY, B.A. (*Down.*), Dairy Bacteriologist
F. BLAKEMORE, M.R.C.V.S., D.V.S.M., Veterinary Officer

ESTATE MANAGEMENT BRANCH

N. DEAN, M.A., F.S.I., L.R.I.B.A., M.R.San.I. (*Trin. H.*)
S. W. EDWARDS, P.A.S.I., A.A.I.,
G. L. PANES, B.Sc. (*Reading*)

STAFFS OF THE RESEARCH INSTITUTES ATTACHED TO THE SCHOOL OF AGRICULTURE

ANIMAL NUTRITION INSTITUTE

(Under the control of a Managing Committee)

SERVICE STAFF

Chemical Section

*F. W. FOREMAN, M.A., F.I.C. (*Cai.*)
*H. E. WOODMAN, M.A., Ph.D. (*Göttingen*), D.Sc. (*Leeds*), (*Down.*)
R. E. EVANS, Ph.D., M.Sc. (*Wales*), (*Cai.*)
A. J. CODLING, Analyst

Physiological Section

*J. HAMMOND, M.A., D.Sc. (*Iowa*), F.R.S. (*Down.*)
T. DEIGHTON, PH.D., M.A., B.Sc. (*Manchester*), (*Non-Coll.*)
A. WALTON, PH.D. (*Down.*)
J. EDWARDS, M.Sc. (*Minn.*), B.Sc. (*Glasgow*), (*Trin.*)

Poultry Nutrition Section

*E. T. HALNAN, M.A. (*Trin.*)
*M. S. PEASE, M.A. (*Trin.*)
E. M. CRUICKSHANK, B.Sc., PH.D. (*Aberdeen*)
H. G. PIKE, Analyst

**Member of the Managing Committee*

Plant Breeding Institute

DIRECTOR

Professor Sir R. H. Biffen, M.A., F.R.S. (*Cath.*)

SERVICE STAFF

H. Hunter, M.A., D.Sc. (*Leeds*)
A. E. Watkins, M.A. (*Joh.*)
G. D. H. Bell, Ph.D. (*Selw.*)

HORTICULTURAL RESEARCH STATION

Director

D. Boyes, M.A. (*Emm.*)

Service Staff

R. M. Woodman, Ph.D., M.Sc. (*Leeds*), F.I.C., A. Inst.P. (*Pet.*)
G. H. Brenchley, M.A. (*Clare*), Mycologist
J. E. M. Mellor, M.A. (*Cai.*), Entomologist
S. O. S. Dark, B.Sc. (*Lond.*), Geneticist

AGRICULTURAL ADVISORY ECONOMIC STAFF

R. McG. Carslaw, Ph.D., Advisory Economist
A. W. Menzies-Kitchin, M.A., B.Sc. (*Aberdeen*)
A. L. Jolly, B.A. (*Jes.*)

SMALL ANIMAL BREEDING RESEARCH INSTITUTE

Director

Professor R. C. Punnett, M.A., F.R.S. (*Cai.*)

VIRUS DISEASES OF POTATOES RESEARCH

Head of Station

R. N. Salaman, M.D. (*Trin. H.*)

Service Staff

K. M. Smith, Ph.D., D.Sc., (*Manchester*), (*Down.*)
F. C. Bawden, M.A. (*Emm.*)
J. P. Doncaster, B.A. (*Cath.*)
C. O'Connor, B.Sc. (*Lond.*)

IMPERIAL BUREAU OF PLANT GENETICS

Professor Sir R. H. Biffen, M.A., F.R.S., (*Cath.*), Director
P. S. Hudson, Ph.D. (*Trin. H.*), Deputy Director

University of Cambridge School of Agriculture Memoirs

THE SCHOOL OF AGRICULTURE INCLUDING ESTATE MANAGEMENT, THE ADVISORY SERVICES AND ASSOCIATED RESEARCH INSTITUTES

Agricultural Education in Cambridge dates from 1892 when the Cambridge and Counties Agricultural Education Committee, an informal body consisting of University Professors and County Council representatives, first organized an Agricultural Course. In 1899 the University created a Department of Agriculture to take over the work of this Committee. The School of Agriculture was built by public subscription in 1909 and expanded by a grant from the Development Commission in 1912. The rapid expansion of the Animal Nutrition Institute and the Plant Breeding Institute under the direction of Professor T. B. Wood and Professor R. H. Biffen led to increased demands on accommodation, and an extension to the building was made in 1925–26 by the aid of a further grant from the Development Commission. The Estate Management Branch has been added since the war for the purpose of providing technical and professional assistance in the management of University and College property and with a view to affording opportunities for practical demonstrations in connection with the teaching of Estate Management subjects.

The Rockefeller Benefaction, made to the University in 1929, provided money for additional accommodation for the Department of Agriculture and for an expansion of its activities, and a new building was completed and occupied in March, 1933.

The Department of Agriculture is primarily a teaching department of the University, but research in the problems of agriculture and cognate sciences is carried out by members of the teaching staff and by members of the staffs of the Research Institutes attached to the Department. Additional facilities for both teaching and research are provided by the University Farm which occupies an area of some 700 acres within reasonable distance of the scientific laboratories.

Reprints available for free distribution. Please quote marginal number instead of full title. Enquiries for papers not starred should be sent to the author.

AGRICULTURE.

BELL, G. D. H.

"Farm Crops."

Farmer's Guide to Agric. Res. 1932.

J.R.A.S.E. 1933, **94,** 161

The application of the effect of length of day on the reproductive and vegetative phases in plants to agriculture, is discussed, together with Lyssenko's pre-treatment, or 'Vernalisation,' of seed. Vernalisation enables winter varieties of cereals to be grown in spring.

The latest researches in cereal investigations are dealt with. These include the nature of disease resistance; physiologic strains of rusts and smuts; the factors underlying lodging; and 'strength' or quality in wheat. The breeding problems connected with these points are also mentioned.

The concluding section deals with the important researches on sterility and incompatibility in apples, plums, and cherries, with their effect on fruit yield and orchard practice.

MANSFIELD, W. S.

"University Farm 1932."

C.U. Agric. Soc. Mag. 1933, **4** (No. 1), 8

292* SANDERS, H. G.

"Graduate Training in Crop Husbandry at Cambridge."

Agric. Prog. 1934, **XI**, 35

A brief account is given of the main features of the course.

261* VENN, J. A.

"The State and Agriculture."

J. Proc. Agric. Econ. Soc. 1934, **3,** 13

Presidential address delivered to the Agricultural Economics Society.

WOODMAN, R. M.

"Early History of the Fenland, Fen Drainage, and of the Fenman."

C.U.Agric. Soc. Mag. 1933, **4** (No. 1), 58

AGRICULTURAL CHEMISTRY.

269* WOODMAN, H. E. and EVANS, R. E.

"The Determination of Total Sulphur and Sulphate Sulphur in Feeding Stuffs."

J. Agric. Sci. 1933, **23,** 459

Methods are described for the determination of total, inorganic and organic sulphur in feeding stuffs and plant products. The results of a number of typical determinations are given.

280* Woodman, R. M.
"Weed Killers."
H.E.A. Year Book. 1933, **2**, 77
A review.

AGRICULTURAL ECONOMICS.

"An Economic Survey of Agriculture in the Eastern Counties, 1932."
(*Farm Econ. Branch Rept.*, No. 21). Pp. 95. Price 2/6 net. Postage 3d.

This publication is a sequel to *Report* 19. Like its predecessor it is an *interim report*, and refers to the economic position of agriculture in the Eastern Counties in 1932. The data on which the findings are based are drawn, as in the previous year, from over 1000 farms well distributed throughout the Province, and covering more than 170,000 acres. Much of the statistical material collected has had to be omitted from these published results for reasons of economy, and the authors' aim has been to include only such information as is likely to supplement the results presented in *Report* 19. For example, Chapter III considerably amplifies the description given in the earlier publication of the economic organisation of farming in the various agricultural "districts" in the Province. Chapter IV describes certain outstandingly successful farm organisations, while in Chapter V debatable points, such as Small Holdings, Specialisation, Mechanisation, etc. are discussed.

But for the wheat "deficiency payments" farm incomes in 1932 would have averaged considerably less than the very low figure obtained in 1931. To express this in another way, it would have been necessary for prices secured for 1932 produce to have been 23 per cent. higher than they actually were in order to provide a fair return on the capital invested and for the work of the occupier. This figure of 23 per cent. compares with that of 18 per cent. shown for the year 1931 in *Report* 19. The "deficiency payments," however, more than off-set this deterioration of the position and, as a result of the Wheat Act, farm incomes for 1932 were actually slightly greater than in the previous year on all except the smallest farms.

There are very marked differences in the production organisation and problems of farms, not only in the different size groups but also in the different "districts" of the Province. These differences are defined and described. In each size group and in each district certain farms are more profitable than others, and the reasons for this are discussed. It is clear that profitableness is definitely not associated with low total costs, and that relatively high capitalisation, output, and yields are commonly related to financial success.

In Chapter VI mole drainage, size of fields, age of occupiers, unemployment in agriculture, and a number of other points are discussed.

Various diagrams and tabular statements are included in the Report.

"Financial Results of Farming in the Eastern Counties of England; Preliminary Statement for 1933."
(*Farm. Econ. Branch. Farmers' Bull.*, No. 3). Price 6d. Post free.

The financial returns secured by farmers in the eastern arable counties of England in 1933 show a marked improvement over those of the preceding year. The most outstanding features on the income side are better gross returns from pigs, greater production and income from wheat and sugar beet, higher prices for barley, and a decline in gross income from horned stock. On the cost side labour has remained practically constant, while there has been an appreciable increase in expenditure on feeding stuffs and miscellaneous outgoings.

300* Carslaw, R. McG.
"The Agricultural Geography of the Eastern Counties."
Agric. Prog. 1934, **XI,** 70

299* Carslaw, R. McG.
"British Poultry Supplies and Demand."
Husbandry. 1934, **IV,** 4

Carslaw, R. McG.
"Forecast of Wheat Acreage in 1934."
Farm Econ. 1934, **I,** 95

Carslaw, R. McG. and Jolly, A. L.
"Variations in the Cost of Wheat Growing."
Farm Econ. 1934, **I,** 105

Carslaw, R. McG. and Menzies-Kitchin, A. W.
"An Economic Survey of Agriculture in the Eastern Counties."
C.U. Agric. Soc. Mag. 1933, **4** (No. 1), 15

Cohen, R. L.
"The Report of the Re-organisation Commission for Milk."
C.U. Agric. Soc. Mag. 1933, 4 (No. 1), 33

Cohen, R. L.
"A Survey of Milk Marketing Schemes and Price Policies."
(*Farm Econ. Branch Rept.* No 20). Pp. 68. Price 2/- net. Postage 2d.

This study attempts to evaluate from the point of view of the community as a whole the price policies adopted by organised farmers in England and America for selling their milk. That such Associations have benefited the farmer there can be little doubt. The dealer, in America, appears to be tolerably satisfied with them. The interests of the consumer are, however, apt to be subordinated. It is generally assumed that a price scheme has been justified if it is shown to be preferable (from the point of view of the consumer) to unorganised competition. Most of the schemes discussed in this study have probably fulfilled this condition. Here a more rigid test is applied; the question discussed is not merely whether the price policy adopted has been better than unorganised marketing, but whether it has been the best that could have been applied, given organised marketing.

Most of the details of the actual operation of the various schemes considered have been drawn from American experience in five large eastern towns where conditions most nearly approximate to those in England. It is impossible to show exactly the effects of the agreements negotiated by the Permanent Joint Milk Committee in England owing to the absence of data on monthly production and utilisation of milk.

It is shown that in the case of milk the competitive determination of prices is not desirable for three main reasons. First, competitive prices will prove unstable owing to the inelasticity of the demand for milk, and the tardy, though substantial, response of supply to price. Secondly, dealers exceed farmers in bargaining power.

Finally, milk prices must be determined for substantial periods in advance. It is desirable, therefore, that farmers should organise.

The price policy at which a Co-operative Association should aim is next analysed. It is then shown that actual Associations generally endeavour to maximise the returns to their members, and to stabilise prices and production. The measures adopted are analysed, and the success which has attended them is described. Finally the scheme of the Permanent Joint Milk Committee in England is compared with the American plans, and an attempt made to estimate the probable effect of the scheme proposed by the Re-organisation Commission for Milk. It is shown, first, that, unless liquid prices in winter are lifted, there may be some danger of a shortage of milk at this season, for summer prices will certainly be raised, both by the operation of the classified price plan, and by the inter-regional compensation payment. This raising of summer prices may lead to a change in the season of calving sufficient to cause a shortage of milk in winter. Secondly, since the same contract price is to prevail throughout any district, farmers particularly favourably situated near any market where higher retail prices prevail than for the area as a whole, will only be able to benefit from their position if they retail their own milk. An increase of producer-retailers in such areas can, therefore, be expected.

Any price plan in an area, it is shown, must take account of (1) the conditions of production in that area, (2) the position relatively to the market of the various farmers, and (3) the markets they have to supply. It must ensure an adequate supply of milk throughout the year at the lowest price which can keep up the scale of production. If prices are to be lifted in summer, special care must be taken to prevent a shortage in winter. But, since it costs more to produce milk in winter than in summer, an excess in winter above the requirements for liquid milk and cream, and above a margin to provide for emergencies, should not be encouraged. Thus the price plan must be very carefully devised. In fact, it is shown that most Associations have had to modify the schemes they have adopted, as their effects have become apparent. In the existing state of knowledge an elastic scheme, capable of modification, is therefore essential.

270* Menzies-Kitchin, A. W.
"Pig Keeping in the Eastern Counties."
Pig Breed. Ann. 1933-34, **13,** 68

Menzies-Kitchin, A. W.
"The Reorganisation Commission for Pigs and Pig Products."
C.U. Agric. Soc. Mag. 1933, **4** (No. 1), 36

Venn, J. A.
"Foundations of Agricultural Economics."
2nd ed. Pp. 600 + XX, with 20 Plates and Numerous Maps and Diagrams. Price 25/- net. Camb. Univ. Press, London, 1933.

The opportunity of a second edition has been taken greatly to enlarge the book by the addition of seven new chapters, of which the first, dealing with the inter-relationship of economic theory and agricultural practice, makes good a serious omission in the previous edition; concurrently, much of the original matter has been re-written. All the information has been brought up to 1933.

AGRICULTURAL ZOOLOGY (including ENTOMOLOGY).

272* Hey, G. L. and Thomas, I.

"On the Biology of *Cacoecia crataegana* Hub. (Lepidoptera : Tortricidae) on Fruit Trees in the Wisbech Area."

Ann. App. Biol. 1933, **20,** 439

An account is given of the life history and habits of the moth *Cacoecia crataegana*, which was found attacking fruit trees in the Wisbech area. A description is given of the egg and egg-laying habits of the moth, and of the morphology and biology of the larva and pupa. The measurement of the larval head capsule in relation to Dyar's hypothesis is discussed. Observations are made on the effect of routine control measures on the egg. One Dipterous and five Hymenopterous parasites were bred out, and the biology of one of these, the egg parasite *Trichogramma evanescens* Westw., is described in some detail.

279* Miles, H. W., Thomas, I. and Hey, G. L.

"On *Hoplocampa flava* L., the Plum Sawfly."

Ann. App. Biol. 1933, **20,** 722

Hoplocampa flava L. is shown to be generally distributed over England and likely to be of great economic importance where plums and damsons are grown extensively. The adults are described and the chief points of difference between *H. flava* and other British Hoplocampids are mentioned. The egg is described and figured and a full description of the larva and the various instars is given. The incubation period and the larval development are discussed.

273* Petherbridge, F. R., Thomas, I. and Hey, G. L.

"On the Biology of the Plum Sawfly, *Hoplocampa flava* L., with Notes on Control Experiments."

Ann. App. Biol. 1933, **20,** 429

Reasons are given for stating that all records of plum sawfly damage in England referred to *Hoplocampa fulvicornis* should be referred to *H. flava* L. Eggs are generally laid singly in the receptacles of the open blossoms, these hatch about 8 days after petal fall and give rise to five larval instars. Several plums may be bored into by one larva ; larvae feed until the end of June when they fall to the ground and spin cocoons. Pupation takes place in the following spring and the adults emerge when plums are coming into blossom. The Czar plum, which flowers in mid-season, is more susceptible to attack than other varieties. Control experiments using Nicotine and Soft Soap were promising in 1929, but yielded no control in 1932. In 1933, however, a spray consisting of Nicotine Sulphate 10 ozs., Lead Arsenate paste 2—3 lb., a Spreader, and water 40 gallons, gave a satisfactory control when applied 6—8 days after petal fall and again 8 days later.

278* Thomas, I.

"On the Bionomics and Structure of Some Dipterous Larvae Infesting Cereals and Grasses. 1. *Opomyza florum* Fabr."

Ann. App. Biol. 1933, **20,** 707

Opomyza florum Fabr. as a pest of cereals has been recorded chiefly from Russia. Injury to wheat by the larva of this fly occurred on experimental plots at the University Farm, Cambridge, in 1931 and 1932. Eggs are laid on the soil near

the germinating wheat in the autumn ; these hatch in the following April and infest the young plants, the central shoot being severed. There are three larval instars and pupation takes place inside the plants in May. Adults emerge in June and live until November. They frequent shady places and may be caught along hedgerows of clover and sainfoin fields. Early sown winter wheat is more liable to attack than that sown after the end of October. The variety Old Fashioned II was found to be more resistant to attack than other varieties examined. A description is given of the egg, the larval instars and the puparium.

ANIMAL BREEDING AND GENETICS.

EDWARDS, J.
" Better Dairy Herd Sires."
Farmer and Stock-Breeder Yearb. 1934, p. 56

EDWARDS, J.
" Breeding for Milk Production."
Yorks. County Milk Record. Soc. Yearb. 1934.

EDWARDS, J.
" The Meaning of Bull Recording."
Lancs. County Milk Record. Soc. Yearb. 1933, p. 28

EDWARDS, J.
" Register of Merit for Bulls."
Dairy Shorthorn J. 1934, **4,** No. 2.
A discussion suggesting the use to which the scheme of progeny-recording of dairy cattle about to be instituted might be put in improving upon existing Register of Merit Schemes.

EDWARDS, J.
" Schemes for Dairy Cattle Improvement in Great Britain."
Proc. 10th World's Dairy Cong. Rome, 1934.
An outline of schemes for dairy cattle improvement in Great Britain with special reference to the part played in them by the progeny test. In particular the Progeny-Recording Scheme* about to be instituted by the Ministry of Agriculture is discussed in relation to certain scientific and practical difficulties.

262* HAMMOND, J.
" Factors Producing Sterility, with Special Reference to Genetic Causes."
Proc. Roy. Soc. Med. 1933, **26,** 1143
A short discussion of the various ways in which sterility may be caused.

244* HAMMOND, J.
" Sterility in Dairy Cattle."
Central Council Milk Record. Soc. Report, 1932, p. 29
A popular account of the occurrence and some of the causes of sterility in dairy cattle together with some suggestions as to treatment or prevention.

* See Memoir 5, p. 17. Edwards and Hammond.

HANLEY, F.

"Eastern Counties Provincial Cockerel Breeding Scheme."
Essex Agric. Comm. Reg. of Egg Records . . . 1932-33, p. 44

PEASE, M. S.

"Acquired Characters—Recent Experimental Evidence."
Eug. Rev. 1933, **25,** 171

PEASE, M. S.

"Developing the Cambar—the New Variety."
Feathered World. May, 1933, p. 807

PEASE, M. S.

"The Development of the Cambar."
Rep. Proc. 10*th Ann. Conf. . . . Poultry Instructors. Min. Agric. and Fish.* 1933, p. 14

PEASE, M. S.

"Poultry Breeding Research in Great Britain, 1930-1933."
Proc. 5*th World's Poultry Cong. Rome,* 1934. (Repr. *verbatim* in *Vet. J.* 1933, **89,** 450)

In addition to summarising experimental work on poultry genetics published in Britain during 1930-33, a report is given of the progress made at Cambridge in improving the Cambars, a breed of poultry produced at the Small Animal Breeding Institute, Cambridge, in which the sexes are distinguishable at hatching by the down colour. This work is essentially a piece of applied Mendelism. The original Cambars were crossed with high grade utility Barred Rocks, the Cambar-down pattern being regained according to expectation in the F_2 and back-cross generations. Such extracted Cambars showed great improvement in egg size and colour, and in total eggs laid per annum. There is, however, still room for improvement in their characters and the problem of " fixing " such a strain of utility Cambars still remains to be faced. Several Mendelian by-products of this cross are reported and discussed in this paper.

PUNNETT, R. C.

"Genetic Studies in Poultry. IX. The Blue Egg."
J. Gen. 1933, **27,** 465

"Olive and Blue!" *Feathered World.* 1934, **90,** 359

The Araucano, a Chilean fowl, lays blue eggs. The articles, titled above, deal with the mode of inheritance of this colour. The blue egg colour behaves as a simple dominant to non-blue. Combined with various shades of brown it gives a series of greens and olives, thus behaving similarly to the polychromatism characteristic of pheasants' eggs.

Brown is similarly dominant to white, but the relation is not a simple one. Two kinds of white eggs are known, one, a recessive white, and another containing a factor (I) which partially inhibits the production of brown pigment. It is this latter type of white that is responsible for the white shell of the Mediterranean

races. In addition, in brown eggs there are three factors; minor factors T_1 and T_2, and a major factor B. The various colour shades of white and brown eggs may be dogmatically grouped as follows for the factors present :—

White Eggs.	Neither T_1 nor T_2 nor B, whether I be present or not.
Pale Tinted.	Either T_1 or T_2, or IT_1T_2.
Pale Brown.	T_1 and T_2, or IB, IBT_1, IBT_2.
Brown.	B.
Deep Brown.	BT_1T_2.

As mentioned above, the blue egg acts as a simple dominant to non-blue. The addition of the blue factor to a tinted egg turns it to a green egg, the shade of olive produced depending on the depth of brown colour present. A point of interest is that the blue tint permeates throughout the thickness of the shell, whereas the brown colour is mainly deposited on the surface of the shell. From the chemical point of view, the brown colour in eggs is due to protoporphyrin, a derivative of the blood pigment, the blue colour, according to Dr. Rudolf Lemberg, is probably the so-called " banded oocyan " of Sorby.

(Abstract by the Editor).

WALTON, A.
" Artificial Insemination."
C.U. Agric. Soc. Mag. 1933, **4** (No. 1), 43

WALTON, A.
" The Technique of Artificial Insemination."
With an Introductory Chapter by A. Walton. *Imp. Bur. Animal Genetics, Edinburgh.* Oliver and Boyd, 1933. Price 2/6.

This Monograph consists largely of a compilation of translations of Russian scientific publications. The latest research on the subject is described and special emphasis is laid upon problems of technique and practical application. It is intended for the agricultural or veterinary research worker who has not ready access to the original publications.

ANIMAL NUTRITION.

308* CRUICKSHANK, E. M.
" Observations on the Feeding of Different Fats to Poultry."
Agric. Prog. 1934, **XI,** 147

A popular article indicating the extent to which body fat and egg fat may be influenced by ingested fat.

CRUICKSHANK, E. M.
" Some Observations on the Formation of Fat in the Fowl."
Essex Agric. Comm. Reg. of Egg Records . . . 1932-33, p. 9

A popular article dealing with the fattening of table poultry.

274* Dunlop, G.

"Methods of Experimentation in Animal Nutrition."

J. Agric. Sci. 1933, **23,** 580

A review is given of the relative merits and disadvantages of the group-feeding, individual feeding and paired-feeding methods, with figures showing their accuracy and sensitivity to treatment differences.

An analysis of the growth records of 584 pigs, fed adequate rations in group feeding experiments, demonstrates that the sex, age, size, type and condition of the animal has no effect on the rate of liveweight increase. The fallacy is pointed out of allotting animals to groups entirely on this basis. While certain litters show faster rates of gain than others the chief factors giving rise to variability in group feeding experiments are the different initial weights of the animals and the varying planes of nutrition which the animals assume. It is therefore necessary to correct for initial weight and to control the intake of food for accurate nutrition studies. A plane of nutrition suitable for swine nutrition studies using a new technique is given. This plane was adopted as the result of a study of the growth-rate of the animals and after using it in various experiments it would appear suitable for most breeds of swine.

The new method of experimentation involves individual rationing according to liveweight, random distribution of the animals for statistical analyses of the results as in field experimentation and elimination of certain uncontrollable factors in other methods, in which they give rise to variability.

A suitable method for correction of the results, when animals temporarily refuse food during the experiment, is suggested and has been found to give concordant results.

It is claimed that by the use of this new method, animals will react quantitatively in the same way to a given treatment at different centres provided the temperature and humidity of the housing accommodation is similar.

304* Dunlop, G.

"Reply to Note by E. J. Sheehy on Methods of Experimentation in Animal Nutrition."

J. Agric. Sci. 1934, **24,** 335

Edwards, J.

"Recent Research and Experimental Work with Pigs."

Pig Breed. Ann. 1933-34, **13,** 135

A summary of pig research carried out at Cambridge, principally in 1932-33.

Halnan, E. T.

"Milk Products for Poultry."

Farmer and Stock-Breeder and Agric. Gaz. 1933, **47,** 2281

A popular article on the value of milk and its by-products for poultry feeding. From consideration of the analyses of these products, it is pointed out that the difference between skim milk, whole milk and buttermilk powders resides chiefly in their fat content, and that from a protein standpoint these three products are approximately equivalent. Dried whey and condensed whey are also regarded

chiefly as sources of sugar and mineral salts. Milk products are shown to confer a resistance to coccidiosis, to have a favourable effect on the growth of young chicks, and to be of value for inclusion in fattening mixtures.

310* Halnan, E. T.

"The Work of the Poultry Nutrition Research Institute, Cambridge."

Agric. Prog. 1934, **XI,** 144

This article is a summary of a paper read before the Agricultural Education Association at Cambridge in July, 1933. Feeding standards for British breeds of poultry on grass runs are included, these standards being based on the results of an investigation carried out in conjunction with J. W. Dallas, Agricultural Organiser for Bedfordshire.

283* Halnan, E. T. and Cruickshank, E. M.

"Some Aspects of Fat Metabolism in Fowls and their Practical Significance."

Proc. 5th World's Poultry Cong. Rome, 1933. Paper No. 54.

This paper consists of a considered statement of the work of the Poultry Nutrition Section of the Animal Nutrition Institute on fat metabolism during the period 1924-1933. It is shown that the cockerel and pullet show marked differences in their relative capacities to store fat during growth, and that a close qualitative relationship exists between the fats contained in a ration and the fats stored in the body of the fowl. By including fats of different character in the fattening ration it thus becomes possible to alter the succulence, flavour and cooking qualities of the carcass. A difference between the alteration in the body fat and the yolk fat, caused by inclusion of fat in the food, is shown to exist. Whereas the body fat is affected by fats consisting largely of either saturated fatty acids or unsaturated fatty acids, the yolk fat is affected to a marked extent only by fats containing unsaturated fatty acids. Thus hemp oil and mutton fat both affect the body fat composition, but whereas hemp oil affects the yolk fat composition, mutton fat does not.

307* Hammond, J.

"Problems of Feeding and Management in Pig Production."

Vet. J. 1934, **90,** 98

Some of the problems in pig feeding and management which have been brought to light by the results of pig recording societies are discussed—possible causes for the losses of young pigs soon after birth and the weight of the pig at weaning time.

Bacon carcasses in which the "eye muscle" of the loin is poorly developed and the muscle is replaced by fat are figured; possible nutritional causes for this are suggested.

Wood, T. B.

"Rations for Live Stock."

8th ed. rev. by H. E. Woodman. *Bull. No.* 48, *Min. of Agric. and Fish.* 1933. (Obtainable from H.M. Stat. Office, London. Price 1/2. Post Free).

Woodman, H. E.

"Utilisation of Excess Potatoes on the Farm."

Problems of Potato Growing. *Roth. Conf.* 1934, **16,** 25

Woodman, H. E.

"The Value of Grazing for Pigs."

J. Min. Agric. 1934, **40,** 1139

An account of the Cambridge investigations into the feeding value of pasture herbage for swine, written specially for the farmer.

268* Woodman, H. E., Evans, R. E. and Norman, D. B.

"Nutritive Value of Lucerne. I. Preliminary Studies of Yield, Composition and Nutritive Value (Season 1932)."

J. Agric. Sci. 1933, **23,** 419

The main object of this investigation was to secure as much information as possible concerning yield, composition (organic and inorganic) and nutritive value from crops of lucerne already established in several different localities. The work may be considered as preliminary to the more systematic investigations begun in the 1933 season.

302* Woodman, H. E., Evans, R. E. and Norman, D. B.

"Nutritive Value of Lucerne. II. Investigations into the Influence of Systematic Cutting at Three Different Stages of Growth on the Yield, Composition and Nutritive Value of Lucerne."

J. Agric. Sci. 1934, **24,** 283

The primary object of these trials was to investigate the composition, digestibility and nutritive value of the first, second and third growths of lucerne under conditions of systematic cutting at the stages of (1) bud, and (2) flower. A determination of the digestibility and nutritive value of lucerne in its pre-budding stage of growth was also made. In addition, account was kept of the effect of cutting lucerne systematically at certain definite stages of growth, namely, pre-budding, budding and flowering, on the yields per acre of dry matter, starch equivalent and digestible protein, and on the health and vigour of the crop.

284* Woodman, H. E. and Norman, D. B.

"Nutritive Value of Pasture. X. The Utilisation of Young Grass by Swine."

J. Agric. Sci. 1934, **24,** 93

In this communication are brought forward the results of digestion trials designed to discover the degree to which pigs are able to digest and utilise young grass. The findings enable the problem of nutrition of pigs allowed a free run on grass to be placed on a quantitative basis.

ANIMAL PHYSIOLOGY.

ASDELL, S. A., HAMMOND, J. and SALISBURY, G. W.
"Mammary Development in the Rabbit."
Anat. Rec. 1933, **55** (Suppl.) 5

Ovariectomy during pseudo-pregnancy arrests development. Development is promoted when corpora lutea are present, whether induced by sterile coitus, prepituitary extracts or urine from pregnant women. As conditions in the first half of pregnancy are similar to those of pseudo-pregnancy, probably the corpus luteum influences mammary development during this time, but not during the second half.

277* DEIGHTON, T.
"Physical Factors in Body Temperature Maintenance and Heat Elimination."
Physiol. Rev. 1933, **13,** 427

Recent literature on the subject is critically reviewed. The diurnal and seasonal variation in metabolism is discussed in the light of the work of Völker, Gersler and others. Skin temperature and temperature gradients in the superficial tissues, subcutaneous fat deposition etc. are commented upon, and the work of Bohnenkamp and his collaborators is fully noticed and the smallness of the allowance made by these workers for conduction and convection criticised. The relation of skin pigment to toleration of sunlight also receives extended treatment.

DEIGHTON, T.
"Half an Acre of Pigs to Feed."
Pig Breed. Ann. 1933-34, **13,** 57

A popular treatment of the problem of surface area and metabolism and the work of the department in these matters.

306* DEIGHTON, T.
"A Study of the Fasting Metabolism of Hogs. I. Age, Weight and Length Data, etc."
J. Agric. Sci. 1934, **24,** 326

The introductory paper of a projected series, this gives the origin, ages, weights and lengths of a considerable number of hogs used in calorimetric experiments during the past five years, together with sundry other data for which a convenient place cannot be found in the plan of subsequent papers.

The age, weight, and length figures are of no practical importance by themselves as the hogs were not kept on a productive ration or treated in any way in a manner comparable with that adopted by the pig producer.

One section of the pigs failed notably to gain weight at the same rate as the rest and the difference is ascribed to the colder surroundings in which they were housed without there being any corresponding increase in the food supplied.

HALNAN, E. T.

"The Cause of 'Watery Whites' and Other Defects of Eggs in Shell."

Notts. Educ. Comm. County Poultry Handb. 1933, p. 9

This article is a popular one dealing with the causes of defects in eggs. Taint, or bad flavour or odour is generally associated with the use of unsuitable packing material, or contact of the eggs with materials possessing strong odours. Fishy taint in eggs is due to a similar cause, since inclusion of as high a content of fishmeal as 15 per cent in the ration does not lead to taint if care in handling and collection is observed.

Meat spots are due to inclusion of portions of the egg follicle or capsule which break off from the ovary, and blood spots and blood eggs are caused by rupture of capillaries of the follicle or upper membranous portion of the oviduct.

Pale or badly coloured yolks are shown to be due to feeding. Watery whites are shown to be of two types, the first type, characterised by irregular or a trembling air space is shown to be due to bad transport conditions and can be reproduced at will in any egg by shaking. The second type, characterised by running air cells, is associated with rupture of the egg membranes and appears to be an inherent fault of the egg itself.

279* HAMMOND, J.

"The Fertilisation of Rabbit Ova in Relation to Time. A Method of Controlling the Litter Size, the Duration of Pregnancy and the Weight of the Young at Birth."

J. Exp. Biol. 1934, **XI,** 140

By matings with fertile bucks at different intervals of time after a mating with a vasectomised buck (to induce ovulation) the time of insemination in the rabbit can be moved successively nearer to, at, and after the time of ovulation.

From inseminations 5 hours before to 2 hours after ovulation the percentage of matings which are fertile, the average litter size, and average number of young per mating fall gradually and at a constant rate until absolute sterility is obtained. Does which produce large litters when mated normally (10 hours before ovulation) may be made to produce small litters by mating shortly before or after the time of ovulation.

The ova are only capable of fertilisation while they are in, or as they leave, the plug at the top of the Fallopian tubes, *i.e.* up to about 6 hours after ovulation. They are incapable of fertilisation as they begin to move down the tube and acquire a layer of albumen around them.

As a result of a mating made about the time of ovulation the apex of the "sperm swarm" arrives at the top of the tube in time to fertilise only those ova which still remain in the plug. The apex of the "sperm swarm" contains relatively few spermatozoa, and so small litters are produced.

By "double matings" of dominant and recessive coloured bucks on recessive coloured does, with a time interval between them, it is possible to measure the relative sizes of the "sperm swarms" at the tops of the tubes at different intervals of time after mating.

The size of the "sperm swarm" and so the interval of time over which it is possible to obtain fertilisation as a result of mating later than normal in relation to the time of ovulation, varies considerably in different males.

The speed at which the sperms ascend the female tract is apparently not affected by the presence in them of male and female sex-determining elements.

The duration of pregnancy is prolonged by reducing the size of the litter. With the prolongation of pregnancy the proportion of young born dead increases. Various possible causes for these facts are discussed.

While there is but little constant increase in the weight of the individual young due to the prolongation of pregnancy from 31 to 34 days, there is a large increase in the individual weight due to reduction in the number of young in the litter.

It is probable that the size of individual young is limited by the amount of some internal secretion or metabolic product of the mother.

275* MARSHALL, F. H. A.

"Cyclical Changes in the Vagina and Vulva of the Ferret."

Quart. J. Exper. Physiol. 1933, **23,** 131

The vagina and vulva of the ferret undergo well-marked cyclical changes in correlation with those of the ovaries and uterus.

During the anœstrum the vulva is small and the connective tissue of which it is mainly composed is compact. The vagina during this period is lined by a low columnar epithelium consisting of only two or three rows of cells and without a cornified layer.

During the pro-œstrum and œstrus the vulva swells up to about fifty times its anœstrous size, the submucous connective tissue becoming spongy and the nuclei of the cells widely separated. The vaginal epithelium is several layers in thickness, and in the deeper part the cells become high and squamous. There is a pronounced cornified layer. Later, during œstrus, the cornified layer begins to slough, the process being continued over some time. The entire period represents the "follicular stage" and is presumably brought about by the action of œstrin. The vulval swelling serves the purpose of facilitating effective copulation which in the ferret is very prolonged.

During pregnancy and pseudo-pregnancy (the latter condition in the ferret only occurring under experimental conditions as after copulation with a vasectomised male) the vulva is reduced to its anœstrous size. The reduction is accompanied by lymphoid degeneration. The vaginal epithelium becomes reduced to a low columnar or cubical structure. There is no cornified layer, this being completely shed during œstrus. This period clearly represents the "luteal phase" in the ovarian cycle.

260* WALTON, A. and WHETHAM, E. O.

"The Survival of the Spermatozoon in the Domesticated Fowl."

J. Exper. Biol. 1933, **10,** 204

Fertility in the hen persists after removal of the cock for about 15 days. Normal spermatozoa are not found in the oviduct throughout this period. Confirming Ivanoff we have shown that fertility persists after irrigation of the peritoneal cavity and oviduct with spermicidal solution. Survival of fertility after treatment persists as long as in the unoperated bird, but the number of fertile eggs laid is reduced by degeneration of ova. These results conform to Ivanoff's hypothesis that spermatozoa may penetrate the immature ova previous to ovulation, but reasons are advanced for regarding this assumption as unwarranted without further evidence.

264* Whetham, E. O.
"Factors Modifying Egg Production."
J. Agric. Sci. 1933, **23,** 383

The seasonal egg production curves throughout the world, grouped according to latitudes, are studied in relation to the seasonal variation of daylight on the corresponding latitudes. There is evidence that alterations in the light ration may affect the egg production by a stimulation of the anterior pituitary and that this increases the production of a hormone governing the production of eggs. From this standpoint the effects on egg production of artificial illumination, date of hatching, age at maturity, levels of production and breed differences have been studied.

ANIMAL PRODUCTION.

254* Edwards, J.
"The Fuller Use of Milk Records."
Central Council Milk Record. Soc. Report, 1932, p. 42

A review of the three major services milk recording is capable of rendering to dairying—rationing according to production, culling of uneconomic producers and information provided for constructive breeding.

Edwards, J.
"Making Milk Recording Pay."
Farmer and Stock-Breeder and Agric. Gaz. 1933, **47,** 2262

Garner, F. H.
"Picking Out Good Dairy Stock."
Farmer and Stock-Breeder and Agric. Gaz. 1933, **47,** 2252

It was shown that the higher yielding cows had large frames, good constitutions, large capacities, and large mammary development.

256* Hammond, J.
"The Anatomy of Pigs in Relation to Market Requirements."
Pig Breed. Ann. 1933-34, **13,** 28

Features of conformation common to both pork and bacon types of pigs are considered in relation to the relative retail prices of different parts of the carcass.

As the back is more valuable than the belly, to get the best out of any breed it should be killed at a stage of growth when the maximum length growth proportions have been made and before too much depth of body has been added.

The value of the meat along the back increases from the head to the tail, and as the proportion of loin to head and neck increases greatly in an improved breed as the pig grows up, but changes very little in an unimproved type such as the wild boar, selection for changes in body proportions is important.

Photographs and measurements of carcasses at shows illustrate how the muscle and fat development on the shoulders and loins increase with body weight.

309* HAMMOND, J.

"Conformation and Development of the Bacon Pig."

Agric. Prog. 1934, **XI,** 127

The proportions of the bacon pig are briefly described. It is pointed out that what is wanted in the pig industry is a means by which the farmer can educate himself in his methods of breeding, feeding and management; this could be done by the institution of Pig Recording Societies.

263* HAMMOND, J.

"How Science Can Help to Improve the Nation's Food Supply—Meat."

J. Soc. Chem. Ind. 1933, **52,** 637

The relations between quality and quantity of the product are discussed and it is suggested that increase of growth made by better feeding can be best utilised by killing the animal at an earlier age, rather than at a larger size. The factors which affect the quantity of the product are discussed under the following headings—the milk supply of the dam: the balance of the ration: the limitation of bulk: and the "lightness" of the feed. The factors which affect the quality of the product—such as proportions of the parts and tissues of the body: the distribution, firmness, and colour of the fat: and the colour, flavour and coarseness of the muscle—are outlined. Marketing organisation is also briefly referred to.

305* HAMMOND, J. and MURRAY, G. N.

"Grading Meat: the Prices Given for Carcasses of Different Weights and Qualities."

J. Agric. Sci. 1934, **24,** 233

This paper provides the commercial considerations which are preliminary to a study of the measurements of muscle, fat and bone in the same carcasses. The prices realised at the auction sales of carcasses at the Smithfield Show for the 10 years 1922-31 have been analysed statistically.

There is a greater difference in price per stone due to the weight of the carcass than to the quality as exemplified by breed differences. It follows, therefore, that the first essential in grading meat is to make weight classes, and then to subdivide these weight classes into grades according to quality. Higher prices are given for the lighter carcasses, and in times of low prices the prices paid for the heavier carcasses are relatively lower than in times of high prices. The decrease in price with increase in weight of the carcass is due to two factors (1) to increase in size of the joints, and (2) to increase in the proportion of fat with increasing weight of carcass within a breed. The weight-price curves for carcasses from the different breeds do not run parallel owing to the different weights at which the different breeds mature. Each breed has a range of weights over which it is best fitted for market requirements.

ESTATE MANAGEMENT.

DEAN, N.

"The Repair and Reconstruction of Farm Buildings."

J.L.A.S. 1933, **32,** 224

WELLER, E. P.

"The Connection Between Tenant-Right Valuation and Farming Efficiency."

J. Proc. Agric. Econ. Soc. 1934, **3**, 51

In practice, the assessment of compensation due to the outgoing tenant of a farm for tenant-right and improvements, and to the landlord for dilapidations and breaches of agreement, is mainly determined by the "custom of the country" and the methods of agricultural valuers. In so far as these customs and methods are out-of-date or unsatisfactory, they may hinder or fail to encourage good farming, and they may cause waste of agricultural capital which the landlord or incoming tenant must expend in remedying the effects of bad farming for which the outgoing tenant has not been sufficiently fined. Improvements in the system might be effected in several ways, including the revision of Statutes and tenancy agreements, the enforcement of a higher standard of knowledge and practice amongst tenant-right valuers and co-operation between them and research workers and other experts. The subject is difficult and important and needs investigation which should include enquiry into the economic results of the present system.

HORTICULTURAL CHEMISTRY.

PETHERBRIDGE, F. R.

"Dusting for Pest and Disease Control in the United States and Canada."

J. Min. Agric. 1933, **40**, 209

This paper gives a short survey of dusting in the control of pests and diseases in the Western and Eastern parts of the United States and in the Eastern and Western Provinces of Canada. It refers more especially to the control of fruit pests and diseases.

PHYSICAL CHEMISTRY.

259* WOODMAN, R. M.

"Wetting, Spreading and Emulsifying Agents for Use with Spray Fluids. V. A Partial Phase Rule Investigation of the Miscible Oil System Phenol-Water-Sodium Oleate-Toluene."

J. Soc. Chem. Ind. 1933, **52**, 185T

The four ternary systems possible in the system phenol-water-sodium oleate-toluene have been studied with the object of ascertaining the boundaries—important in miscible oil formation—between liquid homogeneity and heterogeneity of some type. The presence of water is necessary to obtain miscible oils containing more than a small percentage of emulsifier, and thus miscible oils of practical utility are four-and not three-component systems as previously thought; the ternary system most worthy of study seems to be that containing the aid to dissolution, water, and emulsifier, and not that containing the aid to dissolution, emulsifier, and toxic oil, the first system being the starting point for additions of toxic oil.

281* WOODMAN, R. M.

"Wetting, Spreading and Emulsifying Agents for Use with Spray Fluids. VI. The Effect of Varying Proportions of Water and Aid to Dissolution on Miscible Oil Formation and on the Character of the Emulsions Subsequently Formed From These Miscible Oils."

J. Soc. Chem. Ind. 1933, **52,** 351T

The system emulsifier-aid to dissolution-water appears to be the logical starting point in the preparation of miscible oils containing any toxic oil. In the particular example studied it is possible to select a ternary solution in the isotropic soap phase of optimum composition for incorporating any toxic oil. Addition of excess of water up to a certain amount before incorporation of the toxic oil does not seem to influence markedly the stable and non-creaming characteristics of the oil-in-water emulsions subsequently formed by addition of water in bulk ; similar additions of the aid to dissolution (phenol) before incorporation of the toxic oil, cause undesirable instability and rapidity of creaming in the emulsions so obtained. Though a miscible oil conventionally—and because of practical difficulties—is defined as a clear solution, the results indicate that there is no reason why a turbid miscible oil should not form good spraying emulsions.

282* WOODMAN, R. M. and BARNELL, H. R.

"Wetting, Spreading and Emulsifying Agents for Use with Spray Fluids. VII. The Effect of Gelatin on Water Losses from Leaves."

J. Soc. Chem. Ind. 1933, **52,** 352T

Critical experiments carried out on a statistical basis demonstrate that gelatin films on leaves exert practically a negligible effect on water losses. The inclusion of gelatin or glue in a spray fluid, therefore, is not likely to prove dangerous by clogging the stomata or by interfering with cuticular water losses.

294* WOODMAN, R. M.

"Studies in Emulsions. I. Proteins and Allied Substances as Emulsifiers for Phenolic Liquids."

J. Soc. Chem. Ind. 1934, **53,** 57T

In many instances, proteins, protein-containing substances, and their degradation products yield dual types of emulsions with phenolic liquids ; the oil-in-water only is formed with a hydrocarbon such as toluene. The possible hypotheses in explanation are briefly summarised.

Gels are formed in certain systems, rendering verification of type difficult and often impossible. The formation of these gels is discussed, and the notion put forward that some measure of swelling in water is necessary before emulsoid colloids can emulsify ; the presence of water may, therefore, be essential to emulsification in these instances.

296* WOODMAN, R. M.

"Studies in Emulsions. II. Proteins and Allied Substances as Emulsifiers for Organic Bases."

J. Soc. Chem. Ind. 1934, **53,** 115T

Proteins and allied substances generally yield the dual types of emulsions with the organic bases used ; an aqueous medium of dried egg is an exception, giving only oil-in-water types, possibly because of its lecithin content. Instability and gel

formation sometimes make verification of type difficult or impossible. The preponderance of the evidence in these systems (and in former experiments with protein emulsifiers and phenolic liquids) appears to point to the fact that the mechanism of dual emulsion formation with protein-like emulsifiers (at least) is due to the formation of protein complexes with one or both liquid phases, these complexes being able to act as alternative or opposite-type emulsifiers to other emulsifiers present (*e.g.*, protein itself).

PLANT BREEDING AND GENETICS.

285* Hudson, P. S.

"English Wheat Varieties."

Z. Züchtung. Reihe A. 1933, **18,** 505 : 1934, **19,** 57

The first part consists of a new scheme of classification of the varieties of wheat in cultivation in this country. They are so nearly allied botanically as to fall into the same group of any previous classification. The scheme consists of main divisions on clear botanical characters, further subdivisions being based on a number of entirely new minute differences.

Separate keys are given, based on ear characters, grain characters and characters of the growing plant. For a full diagnosis all three must be used in conjunction.

There follows a full description of each variety in turn, summarising the points in each of the three keys.

The second part is a description of the wheat plant in all stages of development from germination to maturity. The development of the plant as a whole is first described, then the development of the ear primordia.

Development is divided into four periods : formation of foliage, formation of tillers, a short period when the tillers produce ears, and a period when the ears in the tillers cease development. The cessation starts with the last formed tiller and passes backwards, leaving a varying number to continue to maturity.

The total number of spikelets in the ear is fixed early in the life of the plant. Each spikelet produces a number of florets, usually 9 to 10 ; the last formed develop no further and the earlier ones cease successively, finally leaving 2, 3 or 4, according to conditions of development.

Two critical periods were noted when limits were set (a) to the number of developing tillers (b) to the number of fertile florets per spikelet. The relative importance of these two critical periods in determining yield depends on the nature of the conditions under which the plant is developing.

Plants grown under different conditions of manuring and spacing first shewed differences in the number of fertile florets at the critical period for floret development. Yield differences between these two types of plant were due partly to the difference in the number of tillers per plant which produced mature ears. A high-tillering variety was compared in the tillering stage with a low-tillering variety. The high-tillering type showed a gradual falling-off in advance from the first tiller to the last ; the low-tillering type had a small number of tillers almost equally advanced. Under conditions favourable to the development of a large number of tillers the greater vigour of its later tillers will cause varieties of the first type to give a better yield. Under reverse conditions the greater equality of the first, second and third ears will give the advantage to varieties of the second type.

SALAMAN, R. N.

"The Raising of Blight-Resistant Varieties and Virus-Free Stocks." Problems of Potato Growing. *Roth. Conf.* 1934, **16,** 44

An account of the work which is being done at the Potato Virus Research Station, and its relation to the potato industry.

SALAMAN, R. N.

"Research in Relation to the Production of 'Good' Potato Seed." *Agric. Prog.* 1934, **XI,** 77

The problem of potato seed is considered in relation to the obtaining of virus-free seed, and the maintenance of virus-free stocks. A resumé is made of the work that has been in progress for the creation of new varieties which are resistant to the common blight, *Phytophthora infestans,* and the question of different strains of fungus and their relation to the potato is briefly considered.

WATKINS, A. E.

"Origin of Cultivated Plants." *Antiquity.* 1933, **7,** 73

PLANT PATHOLOGY.

288* BAWDEN, F. C.

"Infra-Red Photography and Plant Virus Diseases." *Nature.* 1933, **132,** 168

It is shown that infra-red plates are so sensitive to necrotic changes in the potato that clear photographs can be obtained of commencing necroses barely visible to the eye. Such necroses even when severe cannot be adequately photographed on panchromatic plates. In contrast, the necroses produced by the potato virus "X" on tobacco, which photographs well on panchromatic plates, fail to show in infra-red photographs.

These results may be explained by the different chemical structure of the necroses and by the fact that the panchromatic plates distinguish only between colour changes, whilst the infra-red plates are insensitive to these as such and distinguish between chemical changes which affect the reflection of infra-red rays. The potato necroses contain tannin and pectic substances, which are not present in the tobacco necroses.

295* DICKINSON, S.

"The Nature of Saltation in Certain Species of Helminthosporium and Fusarium." *Ann. Bot.* 1933, **47,** 921

A summary of Research Bulletin No. 88 of the Minnesota Agricultural Experiment Station, November, 1932.

SALAMAN, R. N.

"Virus Disease Research in Relation to the Cultivation of the Potato." *H.E.A. Year Book.* 1933, **2,** 45

A short description of the main virus diseases, and their relation to practical problems of potato raising.

290* Smith, K. M.

"Insects in Relation to Virus Diseases of Plants."

Agric. Prog. 1934, **XI,** 86

In this extract, which is a summary of a paper read at Cambridge in July, 1933, the chief points in the relationship between insects and the plant viruses they carry are emphasised.

287* Smith, K. M.

"The Plant Virus in the Insect Vector."

Arch. Zellforsch. 1934, **15.**

(Paper read at the IIIrd Int. Cong. Cytol.)

The relationship existing between plant viruses and their insect vectors is of three kinds. There is first the mechanical vector, where the virus appears to be carried by chance upon the mouthparts. Secondly there is what may be called the half specific vector, where one insect species has a particular affinity for a plant virus which, however, may also be transmitted by other allied insect species. Thirdly there is the specific insect vector which alone is able to transmit a particular virus. It is an important question as to whether the virus actually multiplies in the body of the insect vector. There is a certain amount of evidence that multiplication of the virus does take place, notably in those cases where the vector remains infective for long periods without again having access to a source of infection.

Smith, K. M.

"Recent Advances in the Study of Plant Viruses."

Pp. XII + 423, with 1 Coloured Plate and 67 Figures. Price 15/- net.

J. and A. Churchill, London, 1933.

This book presents for the first time a coherent account of the plant viruses and the diseases they cause. Work upon the animal and the plant viruses has been co-ordinated and the book is intended to serve both the research worker and the student of plant pathology.

291* Smith, K. M.

"Some Aspects of the Plant Virus Problem."

Agric. Prog. 1934, **XI,** 88

This is a summary of a paper read in London in December, 1933, and it outlines some important points in the plant virus problem such as certain physical properties, the size of virus particles, the symtomatology of virus diseases, methods of dissemination and the development of virus resistant varieties of crops.

276* Smith, K. M.

"Some Virus Diseases of the Potato and other Farm Crops."

Scot. J. Agric. 1933, **16,** 446

This is a semi-popular account of some of the most important virus diseases of farm crops with especial reference to the potato. An account is given, with illustrations, of a number of the potato virus diseases and the insects which disseminate them. The article was written with the idea of assisting the inspector and the practical man to identify the various diseases in the field.

293* Weston, W. A. R. Dillon and Petherbridge, F. R.
"Apple and Pear Scab in East Anglia."
J. Pom. Hort. Sci. 1933, **XI,** 185

Results are given of various spore trapping experiments in East Anglia. These show that ascospores were rarely trapped in or near the trees and that they were not found until after the primary infection by conidia had taken place.

Observations showed that pustules on the one-year-old spur wood were common and together with the pustules on the one-year-old non-fruiting wood were responsible for the primary infection which took place very early. The importance of the lateral spread of conidia in splashes from rain is discussed.

Aphides are shown to be carriers of scab spores.

Spraying experiments show that scab is more readily controlled by one pre-blossom spraying on varieties which are not susceptible to wood infection than on wood susceptible varieties.

PLANT PHYSIOLOGY.

311* Hanley, F.
"Experiments on the Value of Decorticated Sugar-beet Seed."
J. Min. Agric. 1934, **41,** 21

Acid-treated seed brairded from one to five days earlier than untreated seed and gave a more uniform "plant."

Acid-treated seed gave a larger plant population than untreated seed in 21 out of 23 experiments over a period of three years. The two occasions on which increase in plant population was not obtained occurred in 1931, when seed-bed and moisture conditions were generally favourable to germination, and the treatment of the seed was not properly carried out.

Acid-treated seed gave a heavier yield of washed beet per acre than untreated seed on 16 out of 23 occasions. Though the increase was rarely significant at any one centre, its recurrence on 16 out of 23 occasions is sufficient to justify the assumption that, in general, acid-treatment had a beneficial effect on yield.

Mechanically-milled seed gave results intermediate between acid-treated and untreated seed, both as regards plant population and yield of washed beet. Though the differences between the results from acid-treated seed and mechanically-milled seed were not significant, the experiments indicate that mechanical milling, as carried out in the seasons under review, was generally less effective than acid-treatment.

Neither acid-treatment nor mechanical milling produced any effect on sugar-content.

286* Woodman, R. M., Brenchley, G. H. and Hanley, F.
"Soil Treatment for Brassicae. I. The Effect of Sterilisation of the Soil by Mercuric Chloride on the Seedling Growth of Brussels Sprouts."
J. Soc. Chem. Ind. 1934, **53,** 35T

The effect of sterilising seed beds for *Plasmodiophora brassicæ* previous to sowing by the usual concentrations of mercuric chloride solutions is to reduce significantly the dry weights of the tops, roots, and total seedlings of Brussels sprouts. Low

concentrations of the sterilising agent affect the roots much more seriously than the tops, so that the top/root ratio is significantly greater than this ratio for normal seedlings in untreated clean soil, the root thus maintaining a relatively greater top ; with more concentrated solutions the root system is affected still more severely, but the effect on the top is then so great that the ratio is not significantly different from that for the control seedling, a normally-proportioned but smaller seedling being obtained.

SOILS AND MANURES.

303* Nicholson, H. H.

"The Durability of Mole Drains."

J. Agric. Sci. 1923, **24,** 185

Data showing the durability of mole drains in various soil types in farming conditions are given. A method adopted to observe the internal condition of the mole channels by taking plaster casts *in situ* is described. It is shewn that in mole draining, the type and set of the plough and the nature of the soil all affect the channel, particularly as regards fissuring of the walls. The decay of the channels with age and the effects of such factors as gravel in the subsoil are illustrated. The extent and nature of the effect of summer drought on mole drain systems is discussed.

298* Nicholson, H. H.

"The Operation of Mole Drains."

Agric. Prog. 1934, **XI,** 156

Observations on mole drainage systems in heavy gault soil, under grass and arable conditions, are recorded. The nature of the distribution of moisture in the soil profile in various circumstances is described. Outfall records of these systems are compared with existing records made on tile drainage systems. The sharper and heavier run off from heavy land is contrasted with the lower but less fluctuating outfalls from light land. Similar but less marked contrasts between grass and arable land on one heavy soil type are shewn. Permeability measurements on heavy grassland in its moist winter condition reveal a rapid fall in the value of this factor from the surface downwards, to a depth of about 5 inches, at which the value becomes negligible. The nature of the changes in the internal condition of mole drain channels, which occur as they age, is indicated.

Woodman, H. E.

"When Nitrogen Pays on Grass."

Farmer and Stock-Breeder and Agric. Gaz. 1934, **48,** 362

A critical study of the modern practice of intensive fertilising of grassland, based on the results of manurial trials at Cambridge and elsewhere.

STATISTICS.

BARTLETT, M. S.

"Probability and Chance in the Theory of Statistics."

Proc. Roy. Soc. 'A.' 1933, **141,** 518

An attempt is made to show why exact arguments about chance are more fundamental as a mathematical basis for statistical theory and inference than the formulae of inverse probability. Examples of arguments about chances are Fisher's methods of maximum likelihood and fiducial probability. These do not pretend to abolish the judgment and common sense necessary when we use general theory to help us make, from a particular sample, an inference about the "population."

BARTLETT, M. S.

"On the Theory of Statistical Regression."

Proc. Roy. Soc. Edin. 1933, **53,** 260

It is first shown how Wishart's product moment distribution can be split up into a chain of independent factors, thus obtaining most of the known distributions related to regression. In Part II more general assumptions are made, and a generalised partial product moment distribution reached, which shows what are the minimum assumptions about normality necessary for the various distributions obtained in the first part.

COCHRAN, W. G.

"The Distribution of Quadratic Forms in a Normal System, with Applications to the Analysis of Covariance."

Proc. Camb. Phil. Soc. 1934, **30,** 178

The main relevant results concerning the joint distribution of several quadratic forms in a univariate normal system are proved. The theory of analysis of covariance is then investigated, and in particular it is shown that when the treatment sum of squares is corrected by the error regression a modification is required in the usual test of significance.

301* GARNER, F. H., GRANTHAM, J. and SANDERS, H. G.

"The Value of Covariance in Analysing Field Experimental Data."

J. Agric. Sci. 1934, **24,** 250

It is suggested that the covariance method of statistical analysis is of considerable value in correcting for uncontrolled inequalities arising early in an experiment, and in analysing the effects of developmental factors on yield. As an example, its application to the results of an experiment with beans is described.

266* WISHART, J.

"A Comparison of the Semi-Invariants of the Distributions of Moment and Semi-Invariant Estimates in Samples from an Infinite Population."

Biometrika. 1933, **25,** 52

Writers such as Craig and St. Georgescu have been concerned to express the distributions of the sample moment coefficients by means of semi-invariants, whereas Fisher did the same thing for the semi-invariant estimates. It is shown here how one set of results can be transformed into the other, so that the initial calculations may be made by the method most familiar to the worker, and then transformed as required.

289* WISHART, J.
"Field Experimentation: the Modern Technique."
Agric. Prog. 1934, **XI,** 149
A lecture delivered at the summer meeting of the Agricultural Educational Association at Cambridge in 1933. The modern technique, based on the application of statistical methods, and of the analysis of variance in particular, is described and illustrated.

WISHART, J.
"The Place of Statistics in the Experimental Sciences."
C.U. Agric. Soc. Mag. 1933, **4** (No. 1), 49

267* WISHART, J.
"The Theory of Orthogonal Polynomial Fitting."
J.R. Stat. Soc. 1933, **96,** 487
A review of recent contributions to the subject by Aitken and Jordan, who both provide a systematic arithmetical technique for carrying out the fitting. An illustration is provided of the working out of Aitken's method.

WISHART, J.
"The Two-factor Theory of Intelligence."
Nature. 1933, **132,** 677
It has been objected that the Spearman measure of general intelligence, g, is not necessarily invariant for linear transformations of the test scores. It is suggested here that the condition of non-overlap will not hold for the new scores, and that the mathematical limitations need not therefore concern the psychologist.

265* WISHART, J. and HAMMOND, J.
"A Statistical Analysis of the Interrelations of Litter Size and Duration of Pregnancy on the Birth Weight of Rabbits."
J. Agric. Sci. 1933, **23,** 463
With decrease in the number of the litter there is an increased duration of pregnancy. Since the individuals in the small litters are of large size the statistical investigation was undertaken to determine how much of the weight increase with individuals of small litters was due to reduction in the number of the litter and how much to the increased duration of pregnancy. A statistical method for doing this is given. Since the increased weight of young for small litters is due mainly to reduction in the number of young it is suggested that it is probable that the size of the individual young is regulated by the amount of some internal secretion of the mother.

MISCELLANEOUS.

EDE, R.
"The New Extension to the School of Agriculture."
C.U. Agric. Soc. Mag. 1933, **4** (No. 1), 62

PUBLICATIONS.

Publications of the **Animal Nutrition Research Institute.**

1st Report on the East Anglian Pig Recording Scheme.
(Issued June, 1929)

2nd Report on the East Anglian Pig Recording Scheme.
(Issued Oct. 1929)

3rd Report on the East Anglian Pig Recording Scheme.
(Issued July, 1930)

(*These Reports have been discontinued*).

To be obtained from The Secretary, School of Agriculture. Price 1*s*. each.

Cambridge University Agricultural Society Magazine (Issued Annually. 3 numbers comprising a volume).

Vol. 1. (1924-26). Vol. 1. No. 1. 1924 *Out of Print*.
Vol. 2. (1927-29).
Vol. 3. (1930-1932).
Vol. 4. (1933-1934).

To be obtained from the Editor, School of Agriculture, Cambridge. Price, per number, 1925-1932, 1*s*. post free; 1933-34, 2*s*. 6*d*. net or 2*s*. 9*d*. post free.

Publications of the **Farm Economics Branch** of the Cambridge University Department of Agriculture :—

Farmers' Bulletin, No. 1. "Interpretation of Farm Accounts." Price 6*d*. Post Free.

Farmers' Bulletin, No. 2. "Financial Results of Farming in the Eastern Counties of England. Preliminary Statement for 1932." Price 6*d*. Post Free.

Farmers' Bulletin, No. 3. *Same as No. 2,* only for 1933.

Report No. 1. "An Economic and Financial Analysis of Fourteen East Anglian Farms in 1923-24." (*Second Edition.*) 1*s*. net. Postage 1*d*.

Report No. 2. "An Economic and Financial Analysis of Six Eastern Counties Farms in 1924-25." (*Second Edition.*) Price 1*s*. net. Postage 1*d*.

Report No. 3. "An Economic and Financial Analysis of Fifteen East Anglian Farms in 1924-25." (*Second Edition.*) Price 1*s*. net. Postage 1*d*.

Report No. 4. "An Economic and Financial Analysis of Seven Eastern Counties Farms in 1925-26." (*Out of Print.*)

Report No. 5. "A Successful Norfolk Poultry Farm, 1922-26." (*Third Edition.*) Price 1*s*. net. Postage 1*d*.

Report No. 6. "An Economic and Financial Analysis of Thirteen East Anglian Farms in 1925-26." Price 1*s*. net. Postage 1*d*.

Report No. 7. "The Economy of a Norfolk Fruit Farm, 1923-26." Price 2*s*. net. Postage 2*d*.

Report No. 8. "An Economic and Financial Analysis of Seven Eastern Counties Farms in 1926-27." Price 1*s*. net. Postage 1*d*.

Report No. 9. "Sugar Beet in the Eastern Counties, 1927." (pp. 106.) Price 3*s*. net. Postage 3*d*.

Report No. 10. "An Economic and Financial Analysis of Fifteen East Anglian Farms in 1926-27." Price 1*s*. net. Postage 1*d*.

Report No. 11. "An Economic and Financial Analysis of Five Eastern Counties Farms in 1927-28." Price 1*s*. net. Postage 1*d*.

Report No. 12. "Four Years' Farming in East Anglia, 1923-27." (pp. 135.) Price 3*s*. net. Postage 3*d*.

Report No. 13. "Sugar Beet in the Eastern Counties, 1928." No. 2. Price 2*s*. 6*d*. net. Postage 3*d*.

Report No. 14. "The Seasonal Distribution of Farm Labour Requirements." Price 2*s*. net. Postage 1½*d*.

Report No. 15. "Factors Affecting the Price of Potatoes in Great Britain." Price 2*s*. 6*d*. net. Postage 2*d*.

Report No. 16. "Sugar Beet in the Eastern Counties, 1929." No. 3. Price 2*s*. 6*d*. net. Postage 3*d*.

Report No. 17. "An Economic and Financial Analysis of Sixteen East Anglian Farms, 1927-29." Price 1*s*. net. Postage 1½*d*.

Report No. 18. "An Economic Survey of Hertfordshire Agriculture." Price 2*s*. 6*d*. net. Postage 3*d*.

Report No. 19. "An Economic Survey of Agriculture in the Eastern Counties of England, 1931." Price 2*s*. 6*d*. net. Postage 3*d*.

Report No. 20. "A Survey of Milk Marketing Schemes and Price Policies." Price 2*s*. net. Postage 2*d*.

Report No. 21. "An Economic Survey of Agriculture in the Eastern Counties of England." Price 2*s*. 6*d*. net. Postage 3*d*.

Handbook to the School of Agriculture ; containing full information as to the Ordinances governing the teaching, examinations and other activities of the School of Agriculture ; and in addition general information concerning the study of Agriculture at Cambridge. Obtainable from the Secretary, Price 2/6.

Publications of the **Imperial Bureau of Plant Genetics,** School of Agriculture, Cambridge, England.

	s.	d.	
Plant Breeding Abstracts. (Issued quarterly)	15	0	(per annum)
	5	0	(single copy)
Miscellaneous.			
"Breeding Varieties Resistant to Disease"	2	0	
Wheat Breeding Bibliography. Part I. ...	1	6	
Wheat Breeding Bibliography. Part II. ...	2	6	
Barley Breeding Bibliography	1	6	
Lodging in Cereals		6	

Oat Breeding Bibliography	1	6
Rice Breeding Bibliography	1	6
Interspecific and Intergeneric Hybridization in Relation to Plant-Breeding	2	0
Account of the Research in Progress in the British Empire	3	6
Rye Breeding Bibliography	1	6
Bibliography on Breeding Sorghums and Millets	1	0
Subject Index to Vols. I and II of " Plant Breeding Abstracts "	2	6
Vernalization or Lyssenko's Method for the Pre-treatment of Seed	2	6
Plant Breeding in the Soviet Union ...	3	6
Bibliography of Baking Quality Tests ...	2	6
Summary of Reports received from countries exclusive of the British Empire, 1928-31. Supplement I	2	6

The Librarian would welcome gifts of any of the following items which are missing from the Library collections.

Scientific Agriculture. Vols. 1-7.
Rev. of Agric. Oper. in India. 1919-20, 1920-21.
Intern. Mitteilungen f. Bodenkunde. Bds. 5, 8-11.
Rep. Brit. Assoc. Adv. Sci. 1919, 1929, 1930.
J. Roy. Stat. Soc. Vol. 83.
J. South-Eastern Agric. Coll. Wye. Vols. 1-2, 4-8, 11.
Union of S. Africa. Rep. Dir. of Vet. Res. Nos. 1-4.
Bull. of Appl. Bot. and Plant Breeding. Vol. 23, No. 2.
Agric. J. of India. Vol. 14, No. 1.
J. Pom. and Hort. Sci. Vol. 1, No. 1.
Ireland. Dept. of Agric. J. Vol. 1.
Agric. J. of S. Africa. Vol. 12, No. 6.
Farming in S. Africa. Vol. 2, No. 17.
Yorks. Agric. Soc. J. 1925.
Agric. Bull. of the Fed. Malay States. Vol. 7, Nos. 1-2.
Washington Nat. Res. Council Bull., No. 2.
Woburn Exper. Fruit Farm. Rep. Nos. 3, 5, 7-8, 11.
Landbouwkundige Tidskrift, Nos. 514-515, 519, 521, 525.
Ber. d. Ohara Instit. f. Landw. Forschung. Bd. 1, Nos. 2, 3, 6.
Ann. Roy. Bot. Gdns. Peradeniya. Vol. 1, No. 2; XI, No. 3.
New Zealand Off. Yearbook. 1925.
Off. Yearbook of the Commonwealth of Australia. Nos. 12, 16, 21-22.
U.S. Yearbook of the Dept. of Agric. 1891-1894.
J. Univ. Coll. of Wales Agric. Soc. Vols. 2-3.
Madras Agric. J. Vol. 18, No. 1.
Bol. do Min. da Agric. Ind. e Comm. Rio de Janeiro. Vols. 1-2, 1929.
Welsh Plant Breeding Station. Bulls. Ser. H. No. 1.
Agric. J. Brit. East Africa. Vols. 2; 5, Nos. 1-2.
L'Agric. Polonais et des Pays l'Est Europeen. No. 1, 1931.
Australia. Council for Sci. and Ind. Res. Bulls. 1-6, 8-17, 20-21. Pamphlets 1-3.
California Exper. Stat. Tech. Papers, No. 2.
Development Commission Rep. London. Nos. 1-9, 11-12.
Farm Notes. Vol. 1.
Forestry Commission. Bull. No. 3.
J. Imp. Univ. Fac. of Agric., Hokkaido. Vol. 14, No. 5.
J. f. Exper. Landw. im Sudösten d. Eur-Russlands. Vols. 1-2.
J. Brit. Dairy Farmers' Assoc. Vols. 1-18, 21, 31-40.
J. Dept. of Agric. Porto Rico. Vols. 1-8, 9, No. 1.
Mém. de l'Instit. Nat. Polonais d'Écon. Rurale á Pulawy. Vol. 1.
Bull. Imp. Coll. Agric. and Forestry. Morioka. Nos. 3, 8-9.
Olympia Agric. Co. Res. Dept. Bull. Nos. 1-2.
Pusa. Agric. Res. Inst. Sci. Rep. 1916-17: Bull. 3, 7-13, 20, 93, 131-135, 139, 147, 155, 160, 185.
Phosphorsäure (Die). 1931, Ht. 7. 1932, Ht. 1.

Empire Marketing Board. T/P. 11.
Nat. Fruit and Cider Inst. Long Ashton. Rpt. 1911.
Philippine Agric. Review. Vol. 6, Pt. 2 : 11, Pt. 1 : 12, Pts. 1-2 : 14, Pts. 3-4 : 15, Pts. 2-4 : 16, Pt. 2 : 21, Pt. 4 : 22, Pts. 1-3.
Int. Rev. of Agric. Mthly Crop Rpt. Year 20 (1929), Pt. 1.
Agric. Gazette of N.S.W., Vol. 22, Pt. 4.
J. Dept. Agric. Victoria. Vols. 18, Pts. 7-12 ; 19-27.
J. Jamaica Agric. Soc. Vol. 35, Nos. 2-4, 10.
Oxford Inst. for Res. in Agric. Engineering. Abstracts of Current Literature. No. 1, 1931.
Rivista di Zootecnia. Anno. 9, Nos. 1-9, 1932.
Pflanzer (Der). Jahr. 1, Nos. 1-6, 10-12, 15, 17-20 ; 2, Nos. 2-4, 14-17.
Imp. Bureau of Animal Genetics. Quart. Bull., Vol. 1, No. 1, 1931.
Biological Bull. Vol. 53, No. 1.
Gold Coast Dept. of Agric. Bull. 1, 5, 10.
Jealott's Hill Agric. Res. Bull. Vol. 2, Nos. 1.
Philippine Poultry Journal. Vol. 1, No. 11.
Bristol Univ. Dept. of Agric. and Hort. Bulls. 5-7.
Superphosphate. Vol. 1, Nos. 1-5.
J. Heredity. Vols. 1-4 : 5, Nos. 1-7.
(Vols. 1-4 issued as Amer. Breeders' Mag.).
Kühn-Archiv. Vols. 6-8.
Zeit. f. Induk. Abstammungs-und Vererbungslehre. Vols. 13-35.
J. Amer. Soc. Agron. Vol. 8, No. 4.
Worcestershire C.C. Agric. Quarterly Chronicle. Vol. 1, No. 1.
Electro-Culture Comm., Min. Agric. and Fish. Interim Reports, 1st, 4th, 10th.
Genetics. Vol. 4, 1919, pp. 95-204.
L'Agricoltura Razionale. Anno 5, Nos. 2, 5, 1933.
Tucuman. Estacíon Exper. Agric. Bull. 2-4, 6-7, 9-12, 17. Circ. 2-3, 5-9, 21, 23.
Yale Univ. Sch. of Forestry. Bulls. 5-6, 11, 18.
L'Italia Agricola. Anno. 70, Nos. 1-9.
Lancs. Utility Poultry Soc. Stud Book. Vol. 2, 1930.
Punjab Agric. Dept. Seasonal Notes. Vol. 8, No. 1 ; 9, No. 2 ; 10, No. 1.
Royal Dublin Soc. Econ. Proc. Vol. 1, No. 6.
N.I.A.B. Rept. 1st, 1919-20.
Michigan Agric. Stat. Qtly. Bull. Vol. 1, No. 3 ; 7, No. 1 ; 8, No. 1.

Herd Books, Etc.

Border Leicester Flock Book. Vols. 10, 21.
Ayrshire Herd Book. Vols. 3, 14, 31.
Brit. Friesian Herd Book. Vol. 1.
Cheviot Sheep Flock Book. Vols. 7-8, 12, 27, 30, 35.
Cleveland Bay Stud Book. Vols. 2, 5-8, 11-13.
Dorset Horn Flock Book. Vols. 2-6, 9, 23.
English Kerry and Dexter Herd Book. Vols. 17-18.

Exmoor Horn Sheep Breeders' Flock Book. Vols. 1-9, 11-15, 17.
Hackney Stud Book. Vols. 27-33, 35.
Jersey Herd Book. Vols. 12, 14.
Kerry Hill (Wales) Flock Book. Vols. 2-3, 17.
Large Black Pig Soc. Herd Book. Vols. 1-15, 18-19.
Lincoln Red Shorthorn Assoc. Herd Register. Vol. 12.
Nat. Pig Breeders' Assoc. Herd Book. Vols. 19-20.
Roscommon Long Wool Sheep Flock Book. Vols. 1, 13-15.
Ryeland Flock Book. Vols. 1-8
Shirehorse Stud Book. Vol. 5.
Shropshire Flock Book. Vol. 9.
Sussex Herd Book. Vols. 1, 22.

Books for Sale.

The following periodicals are for disposal :—

"Annals of Agriculture." Arthur Young. Vols. 1-6, 11-13, 15-16, 18-24, 26, 28. 1784-1797.

"Berichte über die gesamte Physiologie und Experimentelle Pharmakologie." Abt. B. Vols. 1-58. 1920—1931.

"Hereditas." Vols. 1-14. 1920—30.

Persons interested should communicate to the Librarian stating the price they are prepared to offer.

AUTHOR INDEX

Asdell, S. A., 24

Barnell, H. R., 30
Bartlett, M. S., 36
Bawden, F. C., 32
Bell, G. D. H., 13
Brenchley, G. H., 34

Carslaw, R. McG., 15
Cochran, W. G., 36
Cohen, R. L., 15
Cruickshank, E. M., 20

Dean, N., 28
Deighton, T., 24
Dickinson, S., 32
Dunlop, G., 21

Ede, R., 37
Evans, R. E., 13, 23
Edwards, J., 18, 21, 27
Farm Economics Branch, 14

Garner, F. H., 27, 36
Grantham, J., 36

Halnan, E. T., 21, 22, 25
Hammond, J., 18, 22, 24, 25, 27, 28, 37
Hanley, F., 19, 34
Hey, G. L., 17
Hudson, P. S., 31

Jolly, A. L., 15

Mansfield, W. S., 13
Marshall, F. H. A., 26
Menzies-Kitchin, A. W., 15, 16
Miles, H. W., 17
Murray, G. N., 28

Nicholson, H. H., 35
Norman, D. B., 23

Pease, M. S., 19
Petherbridge, F. R., 17, 29, 34
Punnett, R. C., 19

Salaman, R. N., 32
Salisbury, G. W., 24
Sanders, H. G., 13, 36
Smith, K. M., 33

Thomas, I., 17

Venn, J. A., 13, 16

Walton, A., 20, 26
Watkins, A. E., 32
Weller, E. P., 29
Weston, W. A. R. Dillon, 34
Whetham, E. O., 26, 27
Wishart, J., 36, 37
Wood, T. B., 22
Woodman, H. E., 13, 22, 23, 35
Woodman, R. M., 13, 14, 29, 30, 34

SUBJECT INDEX.

PAGE

Agricultural Economics, Foundations of 16
Geography of the Eastern Counties 15
Agriculture, School of, New Extension to 37
State and 13
University Farm, 1932 13
Animal Breeding, Acquired Characters, Recent Experimental Evidence ... 19
Artificial Insemination 20
Better Dairy Herd Sires 18
Breeding for Milk Production 18
Factors Producing Sterility with Special Reference to Genetic Causes 18
Meaning of Bull Recording 18
Register of Merit for Bulls 18
Schemes for Dairy Cattle Improvement in Great Britain 18
Technique of Artificial Insemination 20
see also Poultry
Animal Nutrition, Fat Metabolism in Fowls and their Practical Significance, Some Aspects of 22
Formation of Fat in the Fowl, Observations on 20
Half an Acre of Pigs to Feed 24
Methods of Experimentation in 21
Methods of Experimentation in, Reply to Note by E. J. Sheehy ... 21
Pig Production, Problems of Feeding and Management in 22
see also Feeding Stuffs
Apple and Pear Scab in East Anglia 34
Artificial Insemination, *see* Animal Breeding
Body Temperature Maintenance, *see* Physiology
Brassica, *see* Brussels Sprouts
Brussels Sprouts, Seedling Growth of, Effect of Sterilisation of the Soil by Mercuric Chloride on 34
Bulls, *see* Animal Breeding
Cacoecia crataegana Hub. on Fruit Trees, Biology of 17
Cereals, Dipterous Larvae Infesting, Bionomics and Structure of ... 17
Cattle, Picking Out Good Dairy Stock 27
see also Livestock
Cockerel, *see* Poultry
Crop(s), Farm 13
Husbandry, Graduate Training in, at Cambridge 13
Drainage, Fen, Early History of 13
Mole Drains, Durability of 35
Mole Drains, Operation of 35
Dusting for Pest and Disease Control in the United States and Canada ... 29
Economics, Agriculture, Foundations of 16
British Poultry Supplies and Demand 15
Economic Survey of Agriculture in the Eastern Counties, 1932 ... 14, 15
Financial Results of Farming in the Eastern Counties of England; Preliminary Statement for 1933 14

PAGE
Forecast of Wheat Acreage in 1934 15
Pig Keeping in the Eastern Counties 16
Survey of Milk Marketing Schemes and Price Policies 15
Variations in the Cost of Wheat Growing 15
Eggs, *see* Poultry
Emulsifiers, *see* Sprays
Emulsions, Studies in 30
Farm Buildings, Repair and Reconstruction of 28
Feeding Stuffs, Determination of Total Sulphur and Sulphate Sulphur in ... 13
Feeding of Different Fats to Poultry, Observations on 23
Grazing, Value of, for Pigs 23
Lucerne, Nutritive Value of 23
Milk Products for Poultry 21
Pasture, Nutritive Value of 23
Potatoes, Utilisation of Excess, on the Farm 23
Fenland, Early History of 13
Fenmen, Early History of 13
Ferret, Cyclical Changes in the Vagina and Vulva of 26
Field Experimentation, *see* Statistics
Fruit Trees, *Cacoecia crataegana* Hub. on, Biology of 17
Fusarium, Saltation in Certain Species of 32
Gelatin, Effect of, on Water Losses from Leaves 30
Grass(es), Dipterous Larvae Infesting, Bionomics and Structure of ... 17
When Nitrogen Pays On 35
Grazing, Value of, for Pigs 23
Helminthosporium, Saltation in Certain Species of 32
Hoplocampa flava L., *see* Plum Sawfly
Insect(s) in Relation to Virus Diseases of Plants 33
Vector, Plant Virus in 33
Leaves, Water Losses from, Effect of Gelatin on 30
Livestock, Rations for 22
see also Animal Breeding, Animal Nutrition, Meat, Physiology, and Specific Animals
Lucerne, Nutritive Value of 23
Mammary Development, *see* Physiology
Meat, Grading, Prices Given for Carcasses of Different Weights and Qualities 28
How Science Can Help to Improve the Nation's Food Supply ... 28
Mercuric Chloride, Effect of Sterilisation of the Soil by, on Seedling Growth of Brussels Sprouts 34
Milk Marketing Schemes and Price Policies, Survey of 15
Production, Breeding for 18
Products for Poultry 21
Recording, Making it Pay 27
Records, Fuller Use of 27
Reorganisation Commission for, Report of 15
Mole Drainage, *see* Drainage
Nitrogen, When it Pays on Grass 35

PAGE

Opomyza florum Fabr. Infesting Cereals and Grasses, Bionomics and Structure of 17
Pasture, Nutritive Value of 23
Pear and Apple Scab in East Anglia 34
Body Temperature Maintenance and Heat Elimination, Physical Factors in 24
Physiology, Cyclical Changes in the Vagina and Vulva of the Ferret ... 26
Fasting Metabolism of Hogs, Study of 24
Fertilisation of Rabbit Ova in Relation to Time 25
Half an Acre of Pigs to Feed 24
Mammary Development in the Rabbit 24
Sterility, Factors Producing, with Special Reference to Genetic Causes ... 18
Spermatozoon in the Domesticated Fowl, Survival of 26
Sterility in Dairy Cattle 18
Pig(s), Anatomy of, in Relation to Market Requirements 27
and Pig Products, Reorganisation Commission for 16
Bacon, Conformation and Development of 28
Fasting Metabolism of, Study of 24
Half an Acre of Pigs to Feed 24
Pig Keeping in the Eastern Counties 16
Production, Problems of Feeding and Management 22
Recent Research and Experimental Work with 21
Utilisation of Young Grass by 23
Value of Grazing for 23
Plant Breeding, English Wheat Varieties 31
Origin of Cultivated Plants 32
see also Potatoes
Plum Sawfly 17
Biology of, with Notes on Control Experiments 17
Potatoes, Blight Resistant Varieties and Virus-Free Stocks, Raising of ... 32
Production of ' Good ' Potato Seed, Research in Relation to 32
Some Virus Diseases of 33
Utilisation of Excess Potatoes on the Farm 23
Virus Disease Research in Relation to the Cultivation of 32
see also Viruses
Poultry Breeding Research in Great Britain, 1930-1933 19
British, Supplies and Demand 15
Developing the Cambar : the New Variety 19
Development of the Cambar 19
Egg Production, Factors Modifying 27
Fat Metabolism in Fowls and their Practical Significance, Some Aspects of 22
Feeding of Different Fats to, Observations on 20
Formation of Fat in, Some Observations on 20
Genetic Studies in : the Blue Egg 19
Milk Products for 21
Olive and Blue Eggs 19
Eastern Counties Provincial Cockerel Breeding Scheme 19
Survival of Spermatozoon in the Domesticated Fowl 26

PAGE
" Watery Whites " and Other Defects of Eggs in Shell, Cause of ... 25
Work of the Poultry Nutrition Research Institute 22
Rabbits, Birth Weight of, Statistical Analysis of the Interrelations of Litter Size and Duration of Pregnancy on 37
Controlling Litter Size, Duration of Pregnancy and Weight of Young at Birth, A Method of 25
Fertilisation of Rabbit Ova in Relation to Time 25
Mammary Development in 24
Saltation in Certain Species of *Helminthosporium* and *Fusarium* 32
Scab, Apple and Pear, in East Anglia 34
Seed Treatment, Experiments on the Value of Decorticated Sugar-Beet Seed 34
Soil Sterilisation by Mercuric Chloride, Effect of, on Seedling Growth of Brussels Sprouts 34
Spermatozoon, Survival of, in the Domesticated Fowl 26
Spray Fluids, Wetting, Spreading and Emulsifying Agents for Use with ... 29, 30
see also Emulsions
Statistics, Comparison of the Semi-Invariants of the Distributions of Moment and Semi-Invariant Estimates in Samples from an Indefinite Population 36
Distribution of Quadratic Forms in a Normal System, with Applications to the Analysis of Covariance 36
Field Experimentation : the Modern Technique 37
Place of Statistics in the Experimental Sciences 37
Probability and Chance in the Theory of 36
Theory of Orthogonal Polynomial Fitting 37
Theory of Statistical Regression 36
Two-Factor Theory of Intelligence 37
Value of Covariance in Analysing Field Experimental Data 36
Sterility, *see* Physiology
Sugar-Beet Seed, Decorticated, Experiments on the Value of 34
Sulphur, Total, and Sulphate Sulphur in Feeding Stuffs, Determination of ... 13
Tenant-Right Valuation and Farming Efficiency, Connection Between ... 29
Vegetables, *see* Brussels Sprouts
Viruses, Infra-Red Photography and Plant Virus Diseases 32
Insects in Relation to Virus Diseases of Plants 33
Plant Virus in the Insect Vector 33
Recent Advances in the Study of Plant Viruses 33
Some Aspects of the Plant Virus Problem 33
Some Virus Diseases of the Potato and other Farm Crops 33
see also Potatoes
Water Losses from Leaves, Effect of Gelatin on 30
Weed Killers 14
Wheat Acreage, Forecast of, in 1934 15
Growing, Cost of, Variations in 15
Varieties, British 31

PRINTED BY
R. I. SEVERS, 5A, MARKET HILL,
CAMBRIDGE